rd RESEARCH DEVELOPMENTS

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Exploring mathematical competencies

Success against the odds

Getting students moving

New secondary diploma to meet students' workplace needs

Australian Council *for* Educational Research

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Photography by Newspix/Bruce Long

Professor Geoff Masters
Chief Executive Officer

Learning from international research

Every three years, the OECD Programme for International Student Assessment (PISA) collects information on student achievement and contextual information about students, teachers and schools. PISA assists governments to understand and enhance the effectiveness of their education systems and to learn from other countries. ACER has been leading an international consortium to conduct this research since the first PISA cycle in 2000. Results from the PISA 2009 will be released in December 2010.

Results from previous PISA studies have been used in a range of ways. In this edition of *Research Developments*, Ross Turner discusses his presentation to the ACER Research Conference *Teaching Mathematics? Make it count* held in Melbourne in August. He draws on ACER's work with PISA, and describes a set of competencies that are fundamental to the development of 'mathematical literacy'.

Kylie Hillman's article also uses PISA results, in a Longitudinal Surveys of Australian Youth (LSAY) project that found low performance in mathematics did not hinder some students' post-school success as much as may have been expected. The project examined the post-school pathway taken by nearly 1600 students across Australia who had taken part in PISA in 2003 and been categorised as low achievers. The study aimed to investigate whether this low performance resulted in poor short-term outcomes for these students when they left school.

Also in this edition, Catherine Underwood explains an innovative approach to an evaluation of the Streets Ahead program using children's artwork to study physical activity and neighbourhood awareness.

ACER has been working with Wesley College in Melbourne in the College's planning of a studio school at Yiramalay in the Kimberley region of Western Australia. The studio school, which will open in 2011, will deliver learning experiences that integrate personal development and academic skills with an extended practical workplace experience. The school's curriculum will be delivered at Yiramalay during the dry season and in Melbourne for the remainder of the year. As Deirdre Jackson explains, students' achievements in the program will be recognised through a newly-accredited certificate to be known as the National Diploma of Education.

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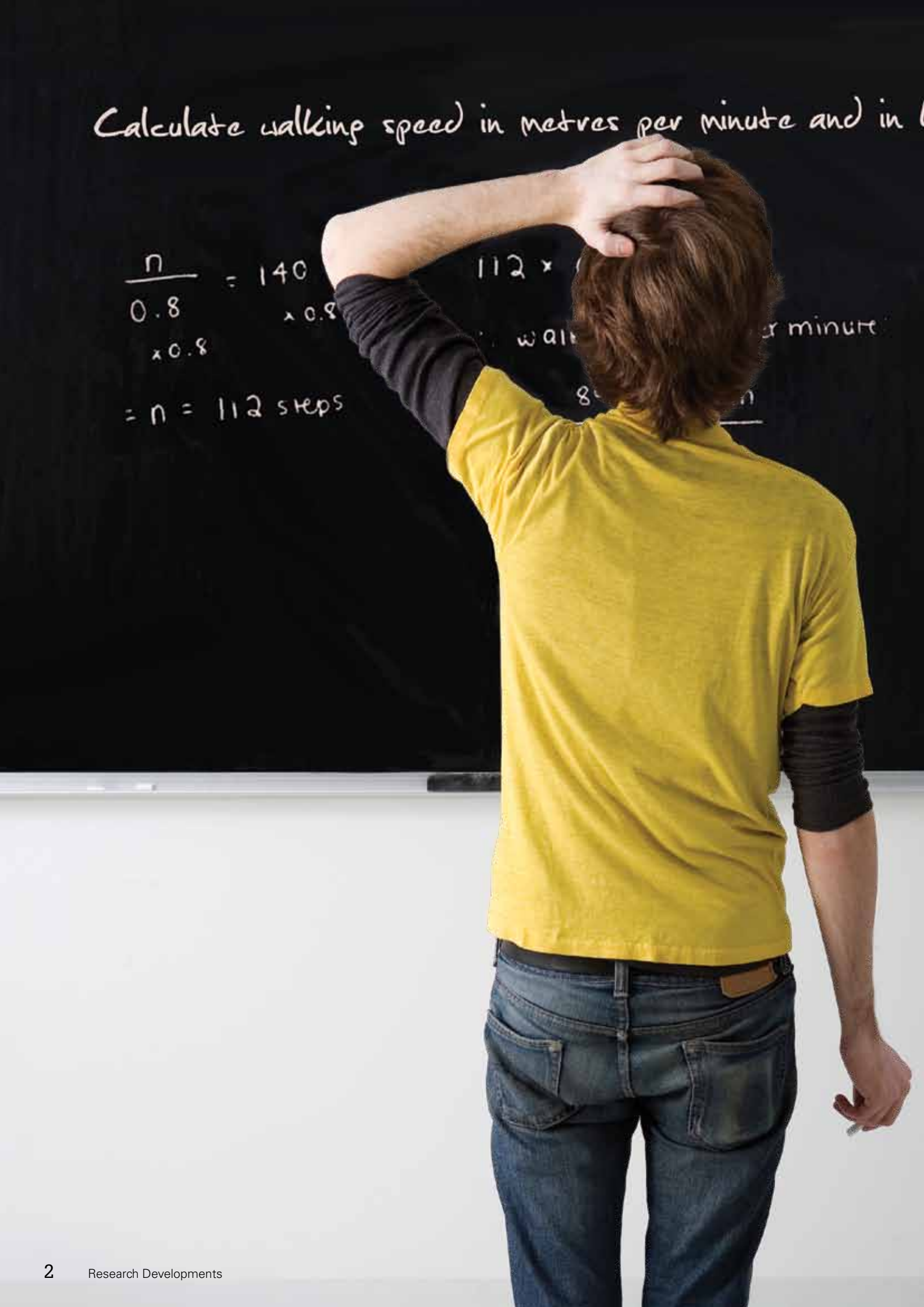
Calculate walking speed in metres per minute and in
n / 0.8 = 140
×0.8
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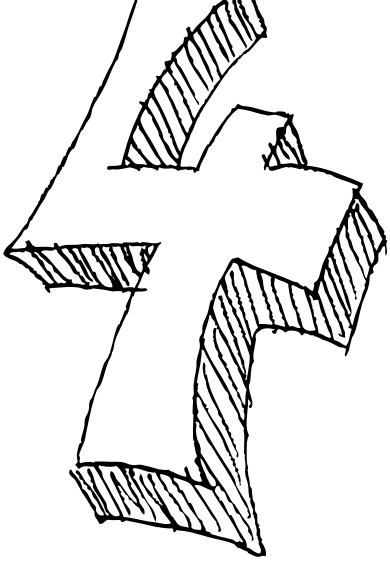
Exploring mathematical competencies

Ross Turner describes a set of competencies that are fundamental to the development of 'mathematical literacy', or a person's ability to apply their mathematical knowledge to practical situations.

Ross Turner is a Principal Research Fellow at ACER and manages the international PISA project.



MATHEMATICAL COMPETENCIES

Communication – Incoming: reading, decoding, interpreting statements and mathematical information. Outgoing: explaining, presenting and arguing.

Mathematising – Transform a real world problem into a mathematical problem. Interpret mathematical objects or information in relation to the situation represented.

Representation – Devising or using depictions of mathematical objects or relationships: equations, formulae, graphs, tables, diagrams, textual descriptions.

Reasoning and argument – Logically rooted thought processes that explore and link problem elements to make inferences from them; or to check a given justification; or to provide a justification.

Strategic thinking – Selecting or devising, and implementing, a mathematical strategy to solve problems arising from the task or context.

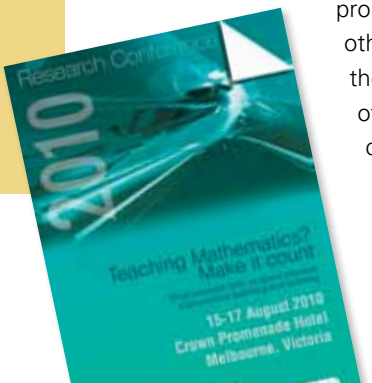
Using symbolic, formal and technical language and operations – Understanding, manipulating, and making use of symbolic expressions; using constructs based on definitions, rules and conventions, formal systems.

In August this year ACER held its annual conference in Melbourne. The theme of this year's conference – *Teaching Mathematics? Make it count* – was chosen to highlight that mathematics education is an area of high priority in Australia. Almost 800 delegates met to review research in mathematics education and debate how lessons learned from this research can be put into practice.

In my own presentation to the conference I outlined research into an area – mathematical competencies – that I believe is very important to mathematics learning but often overlooked. I outlined a set of competencies that are fundamental to the development of 'mathematical literacy'.

The competencies are communication, mathematising, representation, reasoning, devising strategies, and using symbolic, formal and technical language and operations (see box for more detail). These competencies can be thought of as a set of individual characteristics or qualities possessed to a greater or lesser extent by each person.

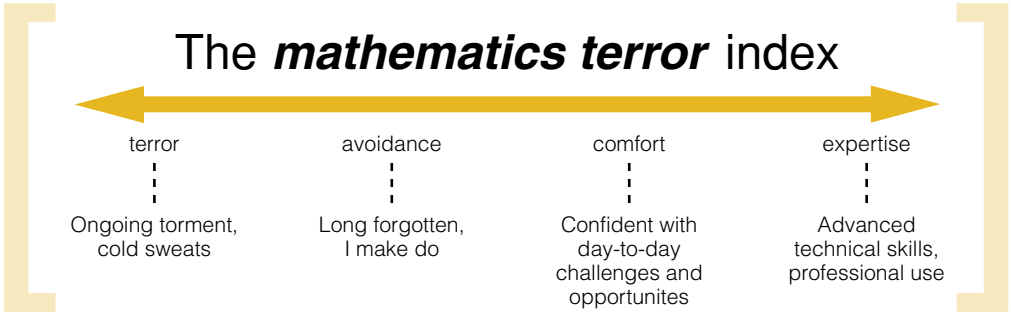
Recent research indicates that the more you possess and can activate these competencies, the better able you will be to make effective use of your mathematical knowledge to solve contextualised problems. In other words the possession of these competencies relates strongly to increased levels of mathematical literacy. In contrast a lack of these competencies contributes to unacceptably large measures on what I like to call the *mathematics terror index*, where many people feel unable to deal effectively with mathematical problems in their daily lives.



A strong argument in support of giving mathematical competencies more attention in Australian classrooms comes out of the OECD's Programme for International Student Assessment (PISA). PISA aims to measure how effectively 15-year-olds can use their accumulated mathematical knowledge to handle 'real-world challenges'. The measures we derive from this process are referred to as measures of *mathematical literacy*. The literacy idea seems to have really taken hold among those countries that participate in PISA. It is generally regarded as very important that people can make productive use of their mathematical knowledge in applied and practical situations.

Some examples of questions used in PISA in 2003 can help us to illustrate how different mathematical problems call for the activation of the six competencies to a differing extent and help explain why some items appear to be harder than others.

Two items from the unit titled *Exports* involve interpreting data presented in a bar graph and a pie chart. The first question calls for the direct interpretation of a familiar graph form: identifying that the bar graph contains the required information, locating the



bar for 1998 and reading the required number printed above the bar.

The second question is more involved, since it requires linking information from the two graphs presented: applying the same kind of reasoning required in the first question to each of the two graphs to locate the required data, then performing a calculation using the two figures found from the graphs (find 9% of 42.6 million). A further question *Carpenter* is presented, which requires some geometrical knowledge or reasoning. Familiarity with the properties of basic geometric shapes should be sufficient to establish that while the 'horizontal' components of the four shapes are equivalent, the oblique sides of Design B are longer than the sum of the 'vertical' components of each of the other shapes.

What do we find when problems such as these are given to random samples of 15-year-olds across over 60 countries around the world? Table 1 shows that Australian students surveyed in PISA have answered these questions more effectively than the international average. The information in the table also shows that more students were able to correctly answer some questions than others; indicating that some were more difficult. Fewer than 20 per cent of all students and 23 per cent of Australian students could answer the 'Carpenter' question correctly.

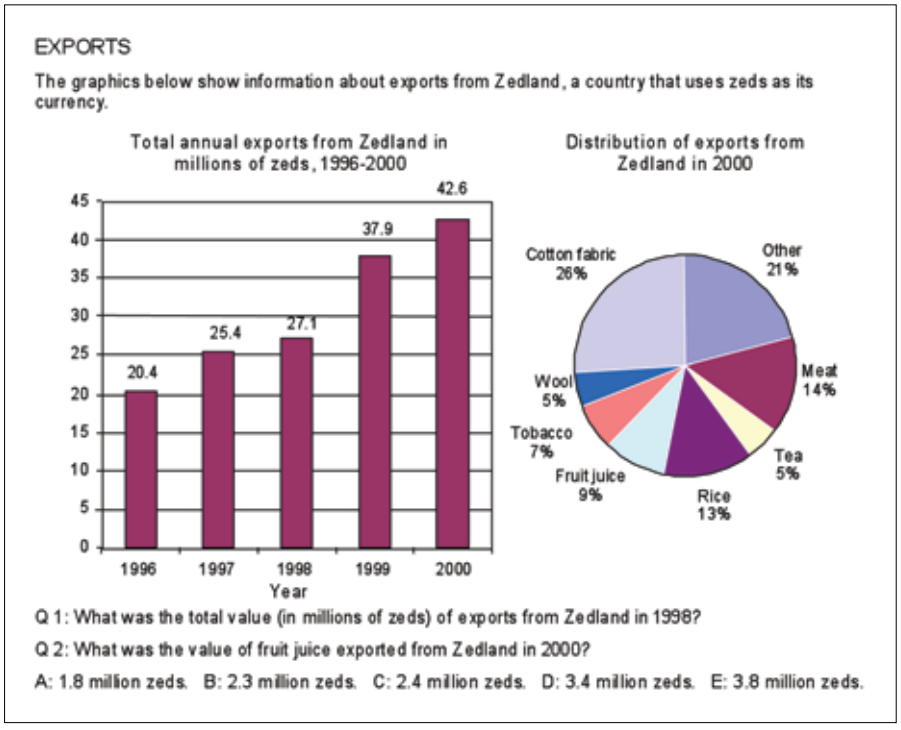


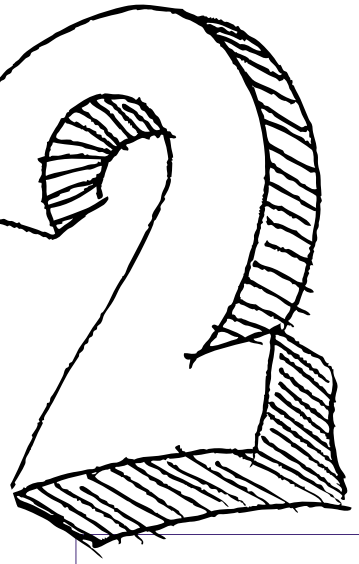
Table 1

Question	Facility (all students)	Facility (AUS students)
Exports Q1	67.2%	85.8%
Exports Q2	45.6%	46.3%
Carpenter	19.4%	23.3%

As a mathematics teacher, I would have hoped that most 15-year-olds could answer questions like these correctly. This also has implications for what happens to these students when they leave school, since the mathematical capabilities students demonstrate by the time they are nearing school leaving age foreshadows the approach those individuals will take to using mathematics later in life and where they might place on the mathematics terror index.

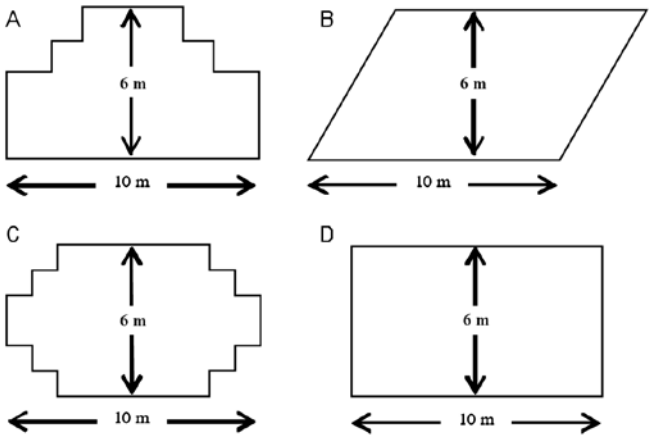
I don't believe it's good enough to see such a high proportion of students unable to answer these mathematics problems correctly. Is the problem that many students don't know the required mathematical concepts; that they have not learned the required mathematical skills? Or could it be that too many 15-year-olds are simply unable to activate the required knowledge when it could be useful; that there is a disconnection between the way in which many of us have been taught, and the opportunities to use mathematics in life outside school? To attempt to answer these questions we need to look in more depth at the mathematical competencies alluded to earlier.

The frameworks that governed the mathematics part of the PISA surveys



CARPENTER

A carpenter has 32 metres of timber and wants to make a border around a garden bed. He is considering the following designs for the garden bed.



Circle either "Yes" or "No" for each design to indicate whether the garden bed can be made with 32 metres of timber.

Garden bed design	Using this design, can the garden bed be made with 32 metres of timber?
Design A	Yes / No
Design B	Yes / No
Design C	Yes / No
Design D	Yes / No

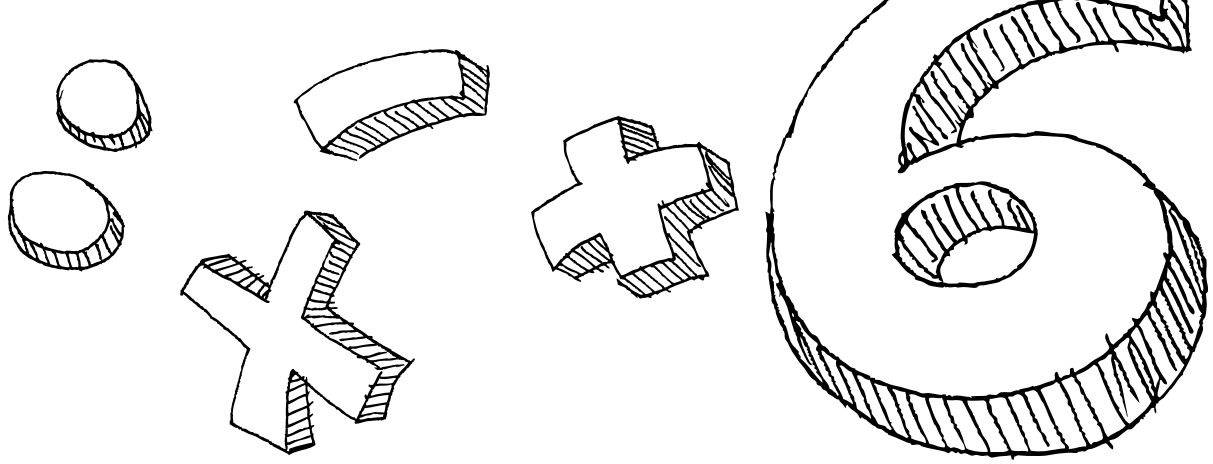
conducted in 2000, 2003, 2006 and 2009 describe a set of eight mathematical competencies. For the purposes of a research activity we have carried out, these have been configured as the set of six competencies described in this article.

Our research has shown that these competencies can be used to explain a very large proportion of the variability in the difficulty of PISA mathematics test items, possibly as much as 70 per cent of that variability. A group of experts assigned ratings to PISA mathematics items according to the level of each competency demanded for successful completion of each item. The researchers found that questions that required students to activate more of these six competencies proved more difficult for students to answer correctly. To identify factors that explain so much of what makes mathematics items difficult is an important finding.

Table 2 summarises outcomes when the experts assigned competencies to the three example questions. Items with a higher facility (they are easier) have lower totals for the 'competency demand', whereas more difficult items demand activation of the competencies at a higher level. For *Exports* Q1, a relatively easy item, the *communication* and *representation* competencies are the most strongly demanded, with the others demanded little or not at all. The *communication* demand lies in the need to interpret reasonably familiar nevertheless slightly complex stimulus material, and the *representation* demand lies in the need to handle two graphical representations of the data. For Q2, the *representation* demand is even higher because of the need to process the two graphs in relation to one another. Each of the other competencies is also called on to some degree, with the need for reasoning, some *strategic thinking*, and calling on some low-level *procedural knowledge* to perform the required calculation. For *Carpenter*, the *reasoning* required comprises the most significant demand, but each of the other competencies is demanded to some degree.

Table 2

Question	Facility (all students)	Competency demand
Exports Q1	67.2%	3.2
Exports Q2	45.6%	6.7
Carpenter	19.4%	8.9



Returning to the questions posed earlier on why so few students were able to answer the more difficult PISA items, I would argue that the problem is the opportunities to use mathematics that we come across in life are not packaged in the same way they were in school. At school you knew when you were going to mathematics class and you knew the mathematics teacher would show you new mathematical ideas or skills, give you some examples and then point you to a set of exercises more or less like those used to demonstrate the idea or skill you were learning. In the real world, that's not normally how opportunities to use mathematics come to us. We have to make the judgments and decisions about what mathematical knowledge might be relevant, and how to apply that knowledge.

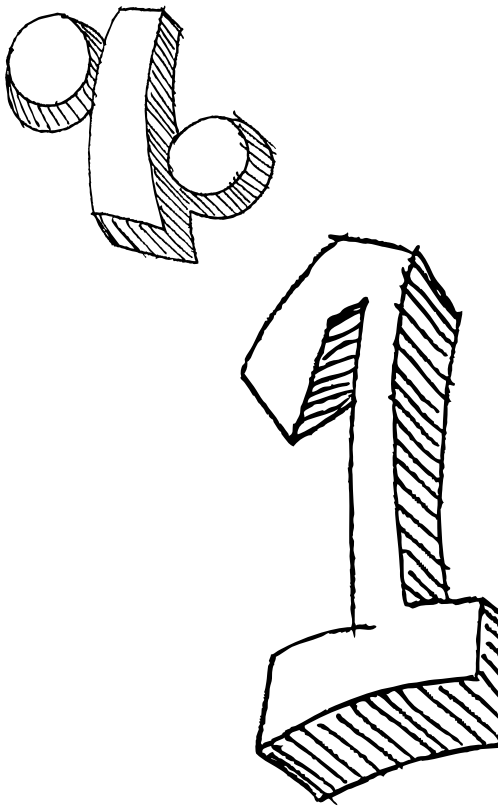
While this research into the role of mathematical competencies has further to go; the results of this work indicate that we must not underestimate the importance of this set of competencies to developing students' mathematical literacy. There are three conclusions that I believe can be drawn from the research so far.

1. Possession of these six competencies is crucial to the activation of mathematical knowledge.
2. The more an individual possesses these competencies, the more able he or she will be to make effective use of his or her mathematical knowledge to solve contextualised problems.
3. These competencies should be directly targeted and advanced in our mathematics classes.

In general, not enough time and effort is devoted in the mathematics classroom to fostering the development in our students of these fundamental mathematical competencies. Moreover, the curriculum structures under which mathematics teachers operate do not provide a sufficient impetus and incentive for them to focus on these competencies as crucial outcomes, alongside the development of the mathematical concepts and skills that typically take centre stage.

These competencies must be given a conscious focus in our mathematics classes, through teaching and learning activities, and through assessment. A key place to start is with the nature of discussion that is facilitated in mathematics classrooms. Students need to be given opportunities to articulate their thinking about mathematics tasks and about mathematical concepts. Obviously teachers play a central role in orchestrating that kind of discussion in class and this provides the basis for encouraging students to take the next key step, writing down their mathematical arguments. Giving emphasis to the communication of mathematical ideas and thinking, both in oral and written forms, is essential both to improving communication skills, but also to developing the mathematical ideas communicated and the capacities to use them.

This article is based on a presentation to ACER's Research Conference 2010: *Teaching Mathematics? Make it count.* The full paper and presentation slides are available from <**www.acer.edu.au/conference**>. The presentations of all conference speakers are also available. Speakers included Mr Phil Daro, University of California; Professor Paul Ernest, University of Exeter; Professor David Clarke, the University of Melbourne; and Professor Kay Stacey, the University of Melbourne. ■



Success
against the odds

Kylie is a research fellow in ACER's National Surveys research program.

Kylie Hillman presents a research project that found low performance in mathematics did not hinder some students' post-school success as much as may have been expected.

It has been long acknowledged that what happens in the immediate post-school years can have important consequences for young people in making their transition from school to employment or further study. Over the years a raft of research studies, including previous research in the Longitudinal Surveys of Australian Youth (LSAY) have indicated that academic achievement in the middle years of secondary school has a big influence on future success in study and the workforce. Poor academic achievement can create serious stumbling blocks for school leavers.

In a recent LSAY study undertaken for the National Centre for Vocational Education Research (NCVER), Sue Thomson and I examined the post-school pathways taken by 1596 students from 294 schools across Australia who had taken part in the 2003 OECD Programme for International Student Assessment (PISA) and been categorised as low achievers. In following their pathways the study aimed to investigate whether this low performance resulted in poor short-term outcomes for these students when they left school, and what factors differentiated between those who went on to succeed and those whose post-school outcomes were not as positive.

In 2003 a nationally representative sample of 15-year-old students from schools across Australia took part in PISA with the major focus on mathematical literacy. Students who took part in PISA later became a cohort group in the ongoing LSAY study; to be known as the Y03 cohort.

According to the OECD, students achieving at PISA proficiency level 2 (see box on page 10) or below are at serious risk of not being able to adequately participate in a 21st century workforce and contribute as productive

citizens. In Australia the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) determined that national standards should be set at PISA proficiency level 3. For the purposes of this project, the 3238 students who did not achieve at or above proficiency level 3 on the 2003 PISA mathematics assessments became the focus of our research.

How well does a students' achievement in PISA predict their subsequent success in life? The definition of 'success' used in this project included satisfaction with life, as well as whether young people were fully occupied with education, employment or a combination of these activities. Those who were fully engaged and happy with their lives were designated as having a 'successful outcome.' This is a more well-rounded definition of success than has been used in previous studies.

For each year that the students remained in the LSAY study (some drop out of the study each year after losing contact) they were contacted by phone annually for the next four years. Each year they were asked a series of questions relating to their engagement with work and study as well as their general happiness with their personal situation. By analysing the information collected up until 2007 it is possible to form a detailed picture of how this group was faring four years on from the PISA assessments.

As is the case for most young people in Australia, the majority of students in our study remained at secondary school and reported in interviews that they had completed Year 12 and been awarded the appropriate qualification for their state. From there, more than one third of them moved into employment – part time or full time – while just under one third went on to tertiary education at a university, TAFE or some other facility.

In each year, the majority of young people who had a full-time job the previous year continued to be in full-time employment the following year. Around a quarter of those who were unemployed were still unemployed a year later. Around one third of those unemployed, however, made the transition to part-time or full-time employment, indicating that for some young people, at least, unemployment was a stop along the path rather than a pathway in and of itself. The unemployment rate of this group was just under 6 per cent. The Australian Bureau of Statistics estimated unemployment at this time was around 3.5 per cent for teenagers and the Dusseldorp Skills Forum estimated youth unemployment at 10 per cent.

In 2007, most of this group of young people, many of whom may have been expected to be experiencing difficulties

PISA Proficiency Levels

At level 3 students can:

- execute clearly described procedures, including those that require sequential decisions.
- select and apply simple problem solving strategies.
- interpret and use representations based on different information sources and reason directly from them.
- develop short communications reporting their interpretations, results and reasoning.

At level 2 students can:

- interpret and recognise situations in contexts that require no more than direct inference.
- extract relevant information from a single source and make use of a single representational mode.
- employ basic algorithms, formulae, procedures, or conventions.
- use direct reasoning and make literal interpretations of the results.

Source: OECD PISA

given their low achievement, were doing relatively well. Around 40 per cent were in some form of further study or training, just over 30 per cent were in full-time employment and another 17 per cent were working part-time.

Overall the outcomes in terms of engagement in education or employment for this group of young people appear fairly positive, with around 70 per cent fully engaged in education or training, employment or a combination of these. However, in comparison to estimates for the full Y03 cohort and published statistics for the population of comparable age, the situation begins to look less favourable.

In 2007, 83 per cent of the full Y03 cohort was fully engaged in education, training and/or employment, while 12 per cent were partially engaged in these activities. Only 5 per cent of the Y03 cohort was unengaged in education, training or employment, meaning that the low performers were twice as likely to be unengaged in work or study activities.

By 2007 there were 1596 young Australians still in the study. We took a closer look at this group to see how student background may have influenced their success and what differentiates between low performers who have successful outcomes and those who do not. It was clear that low performing young people from a low socioeconomic background have a lower likelihood of success than low performers from more affluent homes.

In general, those who were from high or medium socioeconomic backgrounds, who were highly instrumentally motivated (they had agreed while at school that mathematics study was important and worthwhile), enjoyed school, got along well with their teachers, planned to undertake an apprenticeship and came from schools in non-metropolitan areas were more likely to be successful than other study participants. On the other hand, those who did not have any plans for what they might like to do after leaving school, particularly girls without firm career or study plans, were less likely to have a successful outcome.

These findings stress that a positive school experience not only impacts on students' lives at the time they are at school but appears to continue to influence them once they have left. Female students in particular, were more likely to be fully engaged in education, employment or a combination and to be happy with their situation, if they had enjoyed being at school, enjoyed learning and felt safe and secure. While it is not possible to eliminate all stress or negative experiences from secondary school, findings such as this remind us of the important aim of education to foster the social and emotional development of young people, as well as their academic development. Young people who may not be performing as well as their peers should be encouraged to think carefully about their future and to make strategic plans.

Success despite the odds? Post-school pathways of low mathematics performers in Australia by Sue Thomson and Kylie Hillman was released by the National Centre for Vocational Education Research (NCVER) in September 2010. The report is available from www.lsay.edu.au. LSAY has tracked the pathways of young Australians since the early 1990s, through senior secondary school and into the labour force or post-secondary education or training.

Findings from this research were presented to the 12th International Conference on Motivation in Portugal in a paper entitled 'The role of motivation in successful post-school outcomes for low-achieving youth,' also by Sue Thomson and Kylie Hillman. ■

Funding and support for this project was provided by the Australian Government Department of Education, Employment and Workplace Relations through the Longitudinal Surveys of Australian Youth (LSAY) Research, Innovation and Expansion Fund Analysis Grants Program managed by the National Centre for Vocational Education Research (NCVER). The views and opinions expressed in this article are those of the authors and do not necessarily reflect the views of the Australian Government, State and Territory governments or NCVER.

Getting students moving

Catherine is a Research Fellow in ACER's Program Evaluation research program.

A current evaluation of the Streets Ahead program uses children's artwork to study physical activity and neighbourhood awareness. **Catherine Underwood** explains this innovative approach.

'This is a map of my neighbourhood.'

Students' responses to this statement are forming part of an analysis of the physical activity and neighbourhood awareness of primary school-aged children.

The study of drawings by more than 600 Victorian students in Years 3 to 6 revealed that children are more likely to associate their neighbourhood with cars and roads than they are with 'green spaces' such as trees, parks and playgrounds.

ACER is conducting this study for the Victorian Health Promotion Foundation, VicHealth, as an evaluation of a new VicHealth initiative called Streets Ahead.

Streets Ahead aims to increase physical activity in children aged 4 to 12 years through active transport, such as walking and cycling, and by improving their ability to move through public spaces without adult supervision, also known as independent mobility.

ACER is conducting a three-year evaluation of the Streets Ahead program, in order to determine whether the program achieves its goals.

The study asked children to complete two drawing activities and also involved surveys of students in Years 3 to 6, parent or carer surveys, a road safety knowledge test, a neighbourhood survey, pedestrian counts, and interviews with school principals, project officers and representatives from their committees.

As well as drawing a map of their neighbourhood, students were also asked to draw 'How I got to school today and what I saw along the way.' The subsequent pictures revealed that only one in four children walks to school each day.

In general, children who walked to school depicted greater detail in their drawing of the neighbourhood. They included street names and identified specific houses (by occupant name or by description such as 'the grumpy lady's house'). They drew detailed elements of green space such as grass, flowers, ovals and lakes as well as images of people outdoors, people walking their dogs, children playing and people riding bikes.

In contrast, children who travelled to school by car tended to draw elements that were isolated and lacked connection to each other. The car and the road became the central theme as they drew images of traffic lights, road signs, office buildings and shops.

The content of these drawings suggest that children who walk to school demonstrate greater familiarity with their local neighbourhood environment whilst children who travel to school by car show a lack of awareness of

the neighbourhood beyond their own street.

Drawing activities were used to study children's habits because drawings allow for the collection of information in an informal and non threatening way. Drawing allows children of all ages and educational abilities, and of differing language and speech abilities, to freely express themselves. Drawing is not demanding of children and does not require children to read or write.

This study found gender differences in the children's drawings as well as differences based on the age of the student. For example as children got older they tended to use words to write what they saw.

Once the drawings were completed, 10 broad themes were identified in the drawings. These themes were infrastructure, vehicles, buildings, houses, sky, green spaces, people, number of roads, fast food outlets and blank areas. The number of different items depicted that comprised a theme then became the specific 'theme' score. For example a drawing that included roads, traffic lights and crossings would score a three for Infrastructure.

This method enabled the frequency of themes appearing in the drawings to be measured. It was found that 38 per cent of children drew buildings other than houses and 27 per cent drew only their own street, irrespective of mode of transport to school.

For children in Years 3 to 6, the information collected from the drawings could then be combined with survey responses in order to gain a wider perspective of their neighbourhood awareness and their level of physical activity as related to active transport and independent mobility.

Survey responses showed that the children who walked to school are more likely to know the way to the local park, the local shops or their best friend's house than are their counterparts in cars. They have greater awareness of their local neighbourhood environment.

Survey responses also showed that the children who walk to school are more independently mobile than the children who are driven to school. Forty-two per cent of the children who walked to school reported having travelled independently to their friend's house in the preceding week, compared to only 30 per cent of children who travelled to school by car. Similarly, 52 per cent of walkers made their way to the local shops compared to only 35 per cent of car travellers.

Considering that the children who walked to school spent significantly more time exploring the neighbourhood, it is surprising that the percentage of parents who believed that 'stranger danger' was a barrier to their child's physical activity in the neighbourhood was about equal for children who walked or were driven to school (76 and 74 per cent respectively).

The children themselves showed much lower levels of concern; about half of both the walkers and car travellers said they were worried about strangers. However when broken down by gender it was revealed that while boys' worry for strangers was 43 and 42 per cent respectively for walkers and car travellers, the level of worry held by girls was much closer to their parents'; 62 per cent for children who walked to school and 64 per cent for children who travelled to school by car. It was also interesting to note that children's level of concern about strangers was lower when they were walking their dog.

These findings support the conclusion that children who walked to school showed a higher level of confidence and independence and were more actively engaged in moving around their neighbourhood than those children who were driven to school.

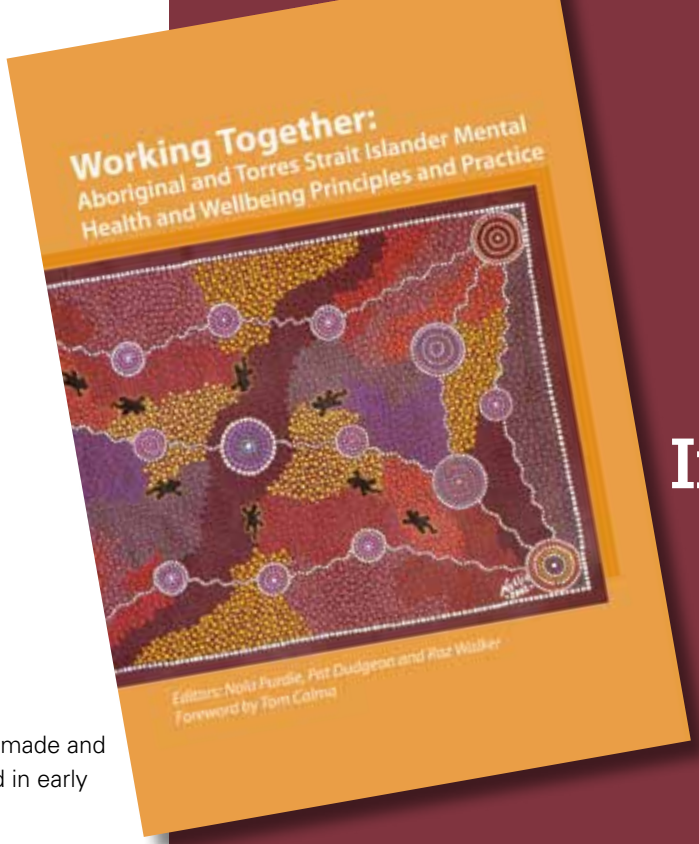
ACER conducted this research in 2009 to collect information as a benchmark for a larger evaluation of the Streets Ahead program. The larger evaluation involves 1 412 students in Years Prep to 6 from 19 primary schools in Victoria.

The same research methods will be used by ACER again at the end of 2010

so that comparisons can be made and the study findings presented in early 2011.

The Streets Ahead program is being implemented in three metropolitan and three regional municipalities. Council project officers will identify and address local barriers to active transport and independent mobility. The program will put innovative strategies in place to encourage children to walk or cycle to school and to travel within their neighbourhoods without adult supervision where safe and appropriate.

Further information about the Streets Ahead program is available from the VicHealth website at <**www.vichealth.vic.gov.au**> ■



New resources to support Indigenous mental health

A unique new text is set to provide valuable cultural awareness information and practical resources in support of Indigenous mental health. The newly released book, *Working Together: Aboriginal and Torres Strait Islander Mental Health and Wellbeing Principles and Practice*, is the first book of its kind.

The Australian Council for Educational Research (ACER) has produced the book under contract to the Australian Government Department of Health and Ageing (Office of Aboriginal and Torres Strait Islander Health) in partnership with Kulunga Research Network. It forms part of the Federal Government's commitment to mental health.

According to co-editor, ACER Principal Research Fellow Nola Purdie, a set of resources dedicated to Indigenous mental health has been long awaited.

The book looks in depth at mental health issues that have hit Indigenous communities particularly hard including suicide, alcohol and other substance abuse, anxiety in young Aboriginal people, trauma, family violence and prenatal mental health. The important issue of appropriate mental health assessments is also carefully addressed.

Previously unpublished models for mental health treatments and an Aboriginal model of healing are included. Other resources have been drawn from *Beyond Blue*.

The book is intended for practitioners and mental health workers as well as students training to be mental health workers. It is available free-of-charge from a website or in print copy by order.

Working Together: Aboriginal and Torres Strait Islander Mental Health and Wellbeing Principles and Practice, edited by Nola Purdie, Pat Dudgeon and Roz Walker with a foreword by Tom Calma was funded by the Office for Aboriginal and Torres Strait Islander Health, Australian Government Department of Health and Ageing, and was developed by ACER and the Kulunga Research Network, Telethon Institute for Child Health Research.

The book is available from http://www.ichr.uwa.edu.au/kulunga/working_together/book

New secondary diploma to meet students' workplace needs

A national diploma with an emphasis on personal and cultural development is now available, as **Deirdre Jackson** explains.

Deirdre is Director of Assessment Services with ACER.

ACER has recently developed the National Diploma of Education for students in the final years of secondary school. It has been designed to provide learning experiences that integrate personal development and academic skills with an extended practical workplace experience in order to develop the attributes necessary for effective workforce participation.

ACER developed the diploma in association with Wesley College in Melbourne, the first school to implement the diploma. (See case study.) ACER is now making the diploma available to be offered at other schools and institutions.

The program offers the opportunity for students to undertake their academic learning within the context of an intensive and extended vocational experience. The course requires ten weeks of vocational placement for each year of the course. This provides an excellent opportunity for people to view what they are learning in relation to what they see in the workplace and community.

The National Diploma of Education has a strong emphasis on personal and cultural development. Students complete 40 hours of community service, which may include participation in a community-based project, voluntary work, or a structured activity such as taking care of a family member or supporting a refugee family. The aim of this is to develop self-confidence, teamwork and a sense of social awareness.

The course is available at Standard or Advanced Level. The Standard Level course is designed for students who are interested in moving directly into employment or further vocational education after completing secondary school. This stream covers: industry learning, personal development, employability skills, literacy, numeracy and ICT literacy. Completion of the course also includes an accredited VET qualification (Certificate II in Work Preparation).

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National Diploma of Education

CASE STUDY

Yiramalay/Wesley Studio School

ACER has worked with Wesley College in Melbourne to develop a new senior years curriculum to be delivered on location in the Kimberley region in Western Australia during the dry season and in Melbourne for the remainder of the year.

The Yiramalay/Wesley Studio School is located on the Leopold Downs Cattle Station via Fitzroy Crossing, about 400 kilometres from Broome.

Eight students from Fitzroy Crossing and 13 from Wesley College in Melbourne have joined the National Diploma of Education program in the first group. During August and September 2010 the Year 10 students spent four weeks at Yiramalay for the first part of the induction process. All the students then spent four weeks in Melbourne in October, along with some other members of the Fitzroy Crossing community.

Wesley College Principal Dr Helen Drennen said, 'It's been great to see how the students have interacted and bonded with each other, and to see how they've grown and reflected on what they've learnt.'

'We have been overwhelmed by their positive response. All have responded beyond our expectations. The students care for each other, tolerate problems, and work to find a solution. It really highlights the value of experiential learning.'

The development of the Studio School is funded outside Wesley College. The Bunuba Cattle Company, in a significant contribution, sold property to provide some of the capital seed funding for the project.

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The Advanced Level course is designed for students who may want to undertake university studies. The course could include a current senior secondary qualification or the International Baccalaureate. A student receives the National Diploma in addition to other certificates (such as the Victorian Certificate of Education or Western Australian Certificate of Education) if they meet the requirements for those certificates. The course could also incorporate subjects from the new national curriculum. Students who complete the National Diploma of Education who want to be considered for university entrance need to complete an additional assessment: uniTEST. The Advanced Level course includes: industry learning, personal development and academic learning. The study of English is compulsory, and includes English subjects drawn from state and territory senior secondary certificates or the International Baccalaureate. Students must also complete three other subjects across at least two of the following domains: humanities and social sciences; mathematics, science or technology; and creative arts.

Students who undertake a full-time National Diploma course after completing Year 10 would usually complete the course at the end of Year 12. Students can take longer than two years if they are studying part time, or if they need an extended period to meet the required standard for any particular subject.

The National Diploma tells people, including employers and tertiary institutions, that a student has everyday adult skills in: reading, writing, speaking, mathematics, computers and the internet. It also certifies that the student has completed a full program as part of senior secondary education and has undertaken workplace training.

The National Diploma is assessed by teachers, supervisors, students or peers (verified by teacher/supervisor). Evidence for assessment may include:

- reflective work journals, diaries or logbooks;
- oral presentations, research assignments, videos, Powerpoint presentations, websites;
- written reports on industry visits or work placements;
- mock interview or simulation exercises; and
- examinations and written tests.

The National Diploma is available to be offered in 'National Diploma Accredited' schools and TAFE Colleges around Australia in 2011. The schools and TAFE colleges will decide which units they are able to offer, and set their own fees.

For further information, or to discuss becoming a National Diploma provider contact ACER Assessment Services Director Deirdre Jackson by email on <**jackson@acer.edu.au**>. ■

Yiramalay/Wesley Studio School continued…

The partnership also received a 2009 Schools First program Seed Funding Award. This was one of 20 awards of $25 000 to help schools continue to develop their school and community partnerships. The Schools First awards program, conducted by ACER, NAB and the Foundation for Young Australians, aims to recognise and support effective school-community partnerships.

The Yiramalay/Wesley Studio School will establish a new framework for cross-cultural learning and the development of intercultural competence among students and adults from different backgrounds. It will provide a relevant and authentic educational experience for Aboriginal students and their families. The school will provide a model for other communities across Australia to work in collaboration.

The industry learning focus will be on the Australian cattle industry, agri-business, eco-tourism, mining management and the arts. The course will also cover personal and intercultural development.

This will be the first time that full-time study for Years 11 and 12 will be available to students in the Fitzroy Valley. Currently their only choice is to complete Years 11 and 12 via distance education, or to leave the region.

'It's wonderful to see how positively the community at Fitzroy Crossing have embraced this. There's a very high level of community support,' Dr Drennen said. ■

ACER announces new Research Division Heads

In late October ACER appointed Dr Sue Thomson to head the newly created Educational Monitoring and Research Division and Dr Khoo Siek Toon to the role of Acting Head of the Assessment and Psychometric Research Division. The new appointments and divisional structure follow the recent retirement of Dr John Ainley (see page 20) after a decade leading ACER's entire research effort.

Dr Thomson has a distinguished research career, specialising in the study of how and why countries and education systems differ in their educational outputs and performances. The new Educational Monitoring and Research Division that she will lead consists of almost 70 staff undertaking research and development in the areas of national surveys, international surveys, higher education, student transitions, policy analysis, program evaluation, teaching, learning and leadership.

Dr Khoo also has a distinguished research career, specialising in the development and implementation of quantitative research methods in education. Dr Khoo is an international authority in student growth modelling. The new Assessment and Psychometric Research Division that she will lead consists of more than 70 staff undertaking research and development in the areas of psychometrics, quantitative research methods, assessment and reporting in the humanities and social sciences and in mathematics and science, and system-wide testing. Dr Khoo becomes Acting Head of Division until a permanent appointment is made.

Lack of evidence hinders Indigenous strategies

Our ability to know what works to improve Indigenous students' attendance and retention levels is hindered by a lack of credible evidence, according to a new research paper. *School attendance and retention of Indigenous Australian Students*, the first Issues Paper produced for the Closing the Gap Clearinghouse, contends that evidence about attendance and retention strategies that work for Indigenous students is not strong.

ACER researchers Dr Nola Purdie and Sarah Buckley co-authored the paper, which draws upon key national and international studies to highlight the issues in analysing Indigenous and non-Indigenous school attendance and retention.

The paper shows that programs and strategies to improve Indigenous students' attendance and retention are varied, and educators are encouraged to use those strategies that have been shown to work. However, a review of material that claimed to evaluate which programs work found that very few high-quality evaluations have been conducted in this area. The paper is available from <**http://www.aihw.gov.au/closingthegap/publications/**>.

Schools First winners announced

Schools First, conducted by NAB, ACER and the Foundation for Young Australians, has awarded $5.2 million to 108 school-community partnerships across Australia in both the Seed Funding and Impact Award categories in 2010. State/Territory Award Winners were announced in October, and receive a further $50,000 towards their partnership. State/Territory winners now vie for the title of National Award Winner. The National Award Winner will be announced at a ceremony in Sydney on 26 November and will receive an additional $400,000.

Schools First is a national awards program pledging $15 million over three years. The program provides:

- financial recognition of success in establishing effective school-community partnerships; and
- financial support to build stronger school-community partnerships.

For more information visit **<www.schoolsfirst.edu.au>**.

VET Leadership for the Future

The Australian Vocational Education and Training (VET) sector faces a leadership succession crisis and must implement strategies to attract, identify and develop a new generation of leaders, according to a new report.

A national survey of 327 practising VET leaders revealed telling insights into current perceptions of the profession. In addition to completing the survey, respondents were asked to provide an analogy that best describes what it is like to be in their current role. The full research report, *VET Leadership for the Future: Contexts, characteristics and capabilities*, is available from <**http://research.acer.edu.au/higher_education/13/**>.

Australian College of Educators award

ACER Research Director, Teaching Learning and Leadership Professor Steve Dinham has been awarded the Sir James Darling Medal by the Australian College of Educators Victorian Branch. The Sir James Darling Medal is named after the founder of the College and is awarded to an eminent Victorian educator, who has made 'an outstanding and sustained contribution to Victorian education.' Steve also took out the ACE NSW branch award, the Sir Harold Wyndham medal in 2005 and is the only person ever to have won both prizes.

Big Science competition

The Rio Tinto Big Science Competition for secondary students was held across Australia in September. The Competition tests critical thinking and problem-solving skills, and knowledge of science. Questions are on contemporary science issues (like car safety and dental health), and are based on the emerging Australian Science Curriculum. Questions in the Big Science Competition are developed by ACER.
The Rio Tinto Big Science Competition is organised by Australian Science Innovations, a non-profit organisation which also runs the Science Olympiads. ASI wants to encourage students to study science and consider careers in science, engineering, technology and medicine. More information can be found at <**www.asi.edu.au/bigscience/**>.

ACER to lead global higher learning study

The Organisation for Economic Cooperation and Development (OECD) has appointed ACER to lead the first global assessment of higher education students' knowledge and skills.

ACER will head a group of international organisations to conduct a feasibility study into the Assessment of Higher Education Learning Outcomes (AHELO).

AHELO has the potential to improve higher education policy and practice by building a global picture of what students have learned and are capable of doing, independent of institution, country, culture or language.

More than 200 higher education institutions from around 15 countries are participating in the feasibility study, which will assess students' generic learning skills and specific subject knowledge in the fields of engineering and economics.

The feasibility study is due for completion in 2011. Study results will inform design and implementation of the full-scale AHELO.

Further information on AHELO is available from <**http://www.oecd.org/edu/ahelo**>.

Initial findings from International Civic and Citizenship Education Study released

Initial findings from the largest international study on civic and citizenship education ever conducted were released on 30 June.

The International Civic and Citizenship Education Study (ICCS) examines how much students have learned about civics through their formal education by reporting on student knowledge, understanding, attitudes, perceptions and activities related to civics and citizenship.

The International Association for the Evaluation of Educational Achievement (IEA) appointed ACER as the study's International Coordinating Centre.

The study of more than 140 000 Grade 8 students in more than 5000 schools from 38 countries revealed:

- Students from Finland, Denmark, Korea and Chinese Taipei showed the strongest results in civic knowledge.
- In almost all countries, girls outperformed boys in their knowledge and understanding of civics.
- Seven of the 15 countries that participated in a previous (1999) IEA study of civic education showed a significant decline in civic content knowledge. Only in Slovenia has there been a significant increase.

The report, *Initial Findings from the International Civic and Citizenship Education Study*, will be followed with an extended report and regional reports for Asia, Europe and Latin America by 2011.

Further information about ICCS, including the report on initial findings, is available from <**http://www.iea.nl/icces.html**>.

ACER Institute delivers PD for Victorian teachers of mathematics

The ACER Institute has been contracted by the Victorian Department of Education and Early Childhood Development (DEECD) to design, develop and deliver two significant mathematics programs for secondary and primary teachers.

Effective Teaching in the Secondary Mathematics Classroom involves the development of two five day professional learning programs, the establishment of an e-community of learners and the face-to-face delivery of four days of professional learning to secondary teachers of mathematics across Victoria.

Effective Mathematics Teaching in the Primary Classroom involves the development of six e-learning modules and the establishment of an online community of learners as well as the face-to-face delivery of four days of professional learning to primary mathematics teachers.

New research database on distance and online education

The ACER Cunningham Library is now producing a new research database on distance and online education. This searchable web database contains details of more than 6000 books, articles, conference papers and reports from publishers in Australia and overseas and is updated monthly. Please visit <**http://cunningham.acer.edu.au/dbtw-wpd/textbase/drde/drde.html**>.

ACER Principal Research fellow joins Queensland expert panel

Dr Gabrielle Matters, Principal Research Fellow and head of ACER's Brisbane office, has been appointed to a nine-member expert panel to help guide the future directions for state education in Queensland over the next decade.

Gabrielle has a wealth of knowledge and experience in the education sector, gained throughout her career as a classroom teacher (physical sciences), school administrator, test developer, policy advisor, university lecturer, researcher, and author.

Queensland's Minister for Education and Training Geoff Wilson said in a media statement on 15 July, ahead of the panel's first meeting, that the panel would provide independent advice on how state education could build on current reforms and address the challenges of the future.

ACER submission to NAPLAN inquiry

In its submission to the Senate Inquiry into the Administration and Reporting of NAPLAN Testing, ACER says planned developments of this testing program will almost certainly enhance its value. ACER also argues that steps should be taken to minimise the misuse of NAPLAN results and to protect and promote the test's diagnostic benefits and potential.

The ACER submission also provided comment on the My School website, and argued that many of the current concerns are likely to be addressed by broadening the range of information provided and increasing levels of user choice.

ACER has been involved in the test development, marking and data analysis of NAPLAN. ACER CEO Professor Geoff Masters is a member of the My School working party convened by ACARA to provide advice on the future development of this site.

ACER's submission is available from the inquiry website at <**http://www.aph.gov.au/Senate/committee/eet_ctte/naplan/submissions.htm**>.

Survey quizzes 300 000 on engagement with learning

In August around 300 000 students and over 10 000 teaching staff were invited to report on their engagement with learning and many of the broader, more enriching aspects of higher education by taking part in the 2010 Australasian Survey of Student Engagement (AUSSE).

The survey involved students and staff from 54 higher education institutions – 32 Australian universities, seven New Zealand universities, and 15 other higher education providers.

The 2010 administration of AUSSE is the largest, most comprehensive and well validated survey yet conducted of whether students and institutions are engaging in effective educational practices.

This is the fourth annual administration of the AUSSE, an ACER study funded by participating institutions, which began in 2007.

Further information about AUSSE is available from <**http://ausse.acer.edu.au**>.

Deputy CEO retires

ACER Deputy CEO (Research) Dr John Ainley officially retired in July after 35 years of service to ACER.

John first joined ACER as a Senior Research Officer in 1975. He held a number of senior research positions before being appointed as Deputy Director and head of research in 2000.

During his years at ACER John has overseen some of our largest and best-known international and national survey projects including the OECD Programme for International Student Assessment (PISA), the Trends in International Mathematics and Science Study (TIMSS) the Longitudinal Surveys of Australian Youth (LSAY) and the IEA Civics and Citizenship Education Study.

He has made an immense contribution to the advancement of education in Australia through advice to a range of government committees and education organisations.

Although John has now officially retired, he continues to work with ACER in a part-time capacity as a Principal Research Fellow.

Research Conference

2011

Indigenous Education: Pathways to success

7-9 August 2011
Darwin Convention Centre
Darwin, Northern Territory

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NEW SERIES FROM ACER PRESS

Available October 2010

Learning in a Changing World

The **Learning in a Changing World** series presents the core areas for teacher librarians and school leaders to consider for 21st century learning: the digital world, virtual worlds, curriculum integration, resourcing and the physical environment. All are essential elements to enable and empower students to be lifelong learners and active participants in our society.

http://shop.acer.edu.au/acer-shop/group/LCW

Designing the Learning Environment

Susan La Marca
ACER Press 2010

Designing the Learning Environment discusses how we develop effective learning spaces with an emphasis on understanding the needs of the major stakeholders of these spaces – students. Designing learning spaces and, in particular, designing school libraries as learning spaces, is presented as an approach to understanding learning needs. Specifically, planning must be learning driven, human-centred and flexible. Designing a Learning Environment begins with the end in sight – it looks at the research and learning theories and uses these as the foundation for planning.

A5073BK $19.95

Connect, Communicate, Collaborate

Judy O'Connell & Dean Groom
ACER Press 2010

Our students are involved in an 'architecture of participation' – creating, adapting and sharing content. Schools and school libraries have many challenges to address to create a renewal of pedagogy and technology work practices. We are being challenged to un-learn and re-learn in order to grant students access to 21st century learning. Connect, Communicate, Collaborate is written to provide the knowledge, inspiration and motivation to get you started.

A5075BK $19.95

Curriculum Integration

Ross Todd
ACER Press 2010

Curriculum Integration presents a curriculum integration matrix for 21st century learning in complex and diverse information environments. It outlines how Guided Inquiry as an instructional framework in 21st century schools can be developed and implemented to enable students to learn meaningfully from diverse and complex information sources.

A5076BK $19.95

Virtual Worlds

Judy O'Connell & Dean Groom
ACER Press 2010

Each year there are more and more avatars in rich virtual environments. These immersive worlds – where the world within the screen becomes both the object and the site of interaction – are on the increase, matching the promise of technology with the creative minds of our students. The challenge is to accept that these interactive environments are here to stay and that schools can, and should, embrace learning in virtual worlds. Virtual Worlds will provide the knowledge, inspiration and motivation to get you started.

A5074BK $19.95

Resourcing for Curriculum Innovation

June Wall & Sandra Ryan
ACER Press 2010

This book provides both an approach to developing school library collections and a balanced view of the types of resources required for student learning. No longer is the book a sole information resource; books and digital collections must now share equal space for learning as that is the growing nature of our students' learning needs.

A5077BK $19.95

For a catalogue or further information contact ACER Customer Service
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